

REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 64, 66 and 71 are active in the application subsequent to entry of this Amendment.

Claim 63 has been withdrawn in order to reduce issues while claims 64 and 71 have been amended to further characterize the first p-type clad layer and the second p-type clad layer. These amendments are consistent with the description of the invention found at page 31, lines 24-25 in respect of the first p-type clad layer and in original claim 57 (and elsewhere) in respect of the second p-type clad layer. Accordingly, these amendments do not introduce added subject matter to the claims.

The issues raised in the outstanding Official Action relate to double patenting and obviousness. To the extent that the examiner's stated concerns may extend to the amended claims presented above, these rejections are traversed.

Claims 64, 66 and 71 stand rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-12 of U.S. 5,652,434 in view of the additional documents of Edmond et al U.S. 5,592,501 and Hayakawa et al U.S. 4,759,024. Applicants disagree that with the position set out by the examiner in the Official Action, particularly on the basis of the above amended claims, and also disagree that the Hayakawa reference is pertinent to the subject matter defined by applicants' claims.

In this rejection the examiner states "Hayakawa et al teach the superlatticed cladding layer would provide a lattice-match between the substrate and the rest of the structure and can grow good quality crystal ... Hence, it would have been obvious to one with ordinary skill in the art to modify the device in U.S. 5,652,434 with the teaching of Hayakawa et al to provide a p-type superlatticed clad layer in order to have a lattice matched structure." (Page 3, lines 9-15 of the Action)

Hayakawa et al is not regarded by applicants to be related art, thus it is illogical and unreasonable to combine the Hayakawa reference with U.S. 5,652,434 (hereinafter

'434 patent). In addition, even if the Hayakawa et al reference is combined with the '434 patent, the resultant structure is different from the structure of claims 64, 66 and 71 of the present application, now amended.

It is a major premise in Hayakawa et al to use GaP as a substrate as described in their claims 1-5. In column 2, lines 10-19, Hayakawa et al describe as one of their objectives "(3) providing a novel semiconductor laser device in which the GaAIP crystal containing only Ga and Al as an element of group III . . . is used as a semiconductor laser material and in which a lattice mismatch between AIP and GaP does not arise . . ." No mention is made of InP in this passage.

Thus, Hayakawa et al provide a laser device by using AIP, GaP and/or GaAIP, all of which have substantially the same in lattice constant. In this regard, and for the examiner's convenience the lattice constants at their a- and c-axes of AIP, GaP and InP, as well as those of AlN, GaN and InN are listed in the Table below:

	Crystal Structure	<u>Lattice Constant (Å)</u>	
		a-axis	c-axis
AIP	ZB	5.4625	-
GaP	ZB	5.4495	-
InP	ZB	5.8694	-
AlN	W	3.111	4.980
GaN	W	3.180	5.166
InN	W	3.533	5.692

Note: ZB: Zincblende; W: Wurtzite

As apparent from the Table above, AIP and GaP have substantially the same lattice constant, whereas InP has a lattice constant larger than AIP and GaP. To reiterate, the technical idea of Hayakawa et al is that a laser device is provided by using AIP, GaP and/or GaAIP alone, which are lattice-matched. The Table above further shows that InN has a lattice constant larger than both AlN and GaN, which have substantially the same lattice constant.

The '434 patent discloses using sapphire and the like as a substrate. However, the '434 patent does not disclose a substrate and nitride semiconductor layers, which are lattice-matched with each other. Therefore, even if the superlatticed p-type clad layer of Hayakawa et al is applied to the device of '434 patent, the resultant device would not have Hayakawa's required lattice match between the substrate and the nitride semiconductor layers. Therefore, there is no motivation to combine Hayakawa et al with the '434 patent.

Further, even assuming *arguendo* Hayakawa et al could be combined with the '434 patent, the resultant structure is different from the present invention. In view of the requirement of Hayakawa et al, it is necessary to use AlN, GaN and/or InGaN – InN would automatically be excluded as it has a larger lattice constant described above, as a substrate and nitride semiconductor layers. To the contrary, the present invention requires that the first p-type clad layer be made of InGaN. InGaN contains In that is soft and therefore the first p-type clad layer acts also as a kind of buffer layer which allows the growth of a nitride semiconductor layer of a good quality, and which does not crack, making it possible make the active layer thin, as described in the present specification. These effects are not suggested to the skilled reader even if Hayakawa et al is applied to the '434 patent.

Thus, the present invention, as claimed in claims 64, 66 and 71 as amended, is not obvious over claims 1-12 of the '434 patent in view of Edmond et al and Hayakawa et al.

To summarize applicants' position, the mere fact the references can be modified or combined is not enough. As stated by the Court in *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783-1784 (Fed. Cir. 1992)(emphasis added):

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggests the desirability of the modification.

Thus, the mere fact that references can be combined or modified (Applicants believe they cannot be) does not render the resultant combination obvious unless the prior art also

suggests the desirability of the combination. *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed.Cir. 1990); MPEP § 2143.01. Hence, the Examiner's attempt to combine the cited references alone without any suggestion in the references of the desirability of the modification is improper and should be withdrawn.

Moreover, the proposed modification cannot change the principle of operation of a reference. *In re Ratti*, 123 U.S.P.Q. 349 (C.C.P.A. 1959); MPEP § 2143.01. However, the Examiner's proposed modification would effectively change the principle of operation of each reference. In particular, the combination of the '434 patent goes directly opposite to Hayakawa's teaching of maintaining a lattice constant.

Addressing next the rejection of claims 63, 66 and 71 as being unpatentable/"obvious" over Edmond in view of Hayakawa, the deficiencies explained above in the teachings of the Hayakawa et al reference hold true for this rejection as well.

The examiner argues "Hayakawa et al teach the superlatticed cladding layer would provide a lattice-match between the substrate and the rest of the structure and can grow good quality crystal [] [h]ence, it would have been obvious to one with ordinary skill in the art to modify Edmond's device with the teaching of Hayakawa et al to provide a p-type superlatticed clad layer in order to have a lattice matched structure." (Page 6, lines 8-14 of the Action).

However, it is not reasonable to combine Hayakawa et al with Edmond because the resultant structure is different from the structure of claims 64, 66 and 71 of the present application, now amended.

As explained in detail above, the main concept of Hayakawa et al resides in eliminating lattice mismatch between the substrate and semiconductor layers to form a laser device.

Edmond et al does not disclose a substrate and nitride semiconductor layers, which are lattice-matched with each other. Therefore, even if the superlatticed p-type clad layer of Hayakawa et al is combined with Edmond et al, the resultant device would not be

lattice matched between the substrate and the nitride semiconductor layers. Therefore, there is no motivation to combine Hayakawa et al with Edmond et al.

Further, even if the lattice-matched requirement of Hayakawa et al is combined with Edmond, the resultant structure is different from the present invention. In view of the requirement of Hayakawa et al, it is necessary to use AlN, GaN and/or InGaN, thereby excluding InN that has a larger lattice constant explained above, as a substrate and nitride semiconductor layers. To the contrary, the present invention requires that the first p-type clad layer be made of InGaN.

Thus, the present invention, as claimed in claims 64, 66 and 71 now amended, is fully patentable over Edmond et al in view of Hayakawa et al.

For the above reasons it is respectfully submitted that claims 64, 66 and 71 define patentable subject matter. Reconsideration of this application, entry of this Amendment and allowance are solicited. If for any reason the examiner requires further information or comments, kindly contact the undersigned by telephone.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____



Arthur R. Crawford
Reg. No. 25,327

ARC:eaw

1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100